THE IMPACT OF EXPERIENCING IMMERSIVE SIMULATION IN TEACHING

by

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by

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INTRODUCTION

Technology within a short amount of time has changed the complexity of education (Settlage, Odom, Pedersen, 2004). Not only is technology expanding in classrooms K-12, it is also expanding on college campuses especially with teacher education programs. In teacher education, professors are researching and developing new, innovative ways to better prepare their pre-service teachers. Virtual Reality is a new tool being used to help pre-service teachers practice teaching in a setting that resembles the reality of a K-12 classroom. One type of Virtual Reality, titled Mursion, is an expanding technology that is being used by more than 65 universities and other programs for pre-service K-12 teacher preparation and professional development (Mursion@ECU, n.d.). In particular, the upper elementary classroom on Mursion environment was created to help "improve pre-service elementary teachers' ability to orchestrate discussions in science and mathematics (Mursion@ECU, n.d.). For this project, data was collected from five individuals who were using Mursion technology in an elementary science methods course, and the results were analyzed to see if this technology contributes to the development of pre-service teachers discourse.

LITERATURE REVIEW

East Carolina University currently uses Mursion technology in its College of Education to help better prepare their pre-service teachers before entering the classroom. This technology creates "powerful and immersive learning simulations" for pre-service teachers looking to develop their ability to stimulate discourse in the classroom (Mursion@ECU, n.d.). Similar Virtual Reality technology was used in a study at the Catholic University of Milan where the main goal was to "analyze the possible use of VR as an affective medium" (Riva, Mantovani, Capideville, Preziosa, Morganti, Villani, & Alcañiz, 2007). They tested 61 undergraduate students using three virtual parks (anxious, relaxing, and neutral). Measurements were collected using questionnaires for emotional and presence assessments, as well as using ratings of their emotions and presence during the VR experience (Riva et al, 2007). They found that VR is affective media, and that virtual parks were able to "induce the expected emotional states" (Riva et al, 2007).

In the same study, researchers also found a connection between emotion and presence. They defined "presence" as "'sense of being there' or the 'feeling of being in a world that exists outside the self'" (Riva et al, 2007). The results showed that in the anxious and relaxing parks the level of presence was significantly higher than in the neutral one. The link between emotion and presence is influenced by the "overall characteristic" of the VR experience, and not directly connected to a specific emotional state (Riva et al, 2007).

E. Rothkopf believes teachers are responsible for facilitating activities that give birth to learning. He termed these activities "mathemagenic activities" (Rothkopf, 1970). A research

study conducted by Erdogan and Campell expanded upon this idea and looked at "the role and usage of teacher questions" and how the students interacted with these questions. Throughout their research they used quantitative and qualitative methods to find that that teachers using constructivist teaching methods asked a far greater number of questions than teachers using low levels of constructivist teaching practices. Not only were they asking more questions, but more questions were open-ended. This type of questioning aims to have students actively involved in the process of their own learning (Erdogan & Campbell, 2008).

Methods

This study arose from work with 5 pre-service elementary education majors enrolled in a science methods course at East Carolina University. The purpose of this study was to analyze how using Mursion technology in pre-service science education courses contributes to the development of self-eficacy and preparation in pre-service teachers.

Participants. In this study, data was collected from elementary preservice teachers at East Carolina University that are enrolled in a science methods course. The students' thoughts and overall experiences were examined by reviewing their answers to questions they were asked in interviews before and after each VR and classroom experience. All five participants were Caucasian females, and the ages ranged from 19 to 24.

Instruments. The research design was a case study, using interviews as our instrument to answer research questions. At the interview, a semi-structured, face-to-face interview approach was used pursuing a *within subject design*. The questions asked were open ended and required the pre-service teacher to draw from his/her own personal experiences with technology and time in the classroom (see full list of interview questions in Appendix A, B, C, D, E, F). Each

interview was expected to last about 10 minutes. A recording device (iPad, phone) was used to record the dialogue of the interview. Additional materials included, a pen and a piece of paper with the questions typed out, to take notes on the responses of the interviewee. The study included a description of the participants using demographic questions asked in the interview (including use of VR, experience with Mursion, experience in the classroom, and number of education courses). It also included quantitative research using six interview protocols: one for before Mursion 1, one for after Mursion 1, one for before Mursion 2, one for after Mursion 2, one for before the classroom experience, and one for after the classroom experience. The sample was five people. All five were caucasion females, ranging in ages 20-23. Four of the participants were in their second semester of Junior year, while one student, Student 4, was in her first semester of Senior year. All five were interviewed before and after each simulation. Their interviews were analyzed, transcribed, and observed for patterns using an inductive analysis approach, without knowing what the outcomes would be.

Procedure. At the beginning of the first interview, the interviewee was asked to sign a consent form (see full face-to-face interview consent form in Appendix G). The participants were then asked questions related to use of VR, experience with Mursion, experience in the classroom, and number of education courses. Six interviews were conducted for each of the five participatns. A recording device (iPad, phone) was used to record the dialogue of the interview, and a pen to write down the key points of the responses onto the printed out questions, during each interview. Following the interview, the dialogue was analyzed.

Appendix A

Interview Before Mursion 1

1 What is your year in college?

2 What race or ethnicity do you consider yourself?

3 What gender do you identify as?

4 How much experience have you had teaching in the classroom?

5 How much experience have you had with Mursion technology?

6 How often do you use technology?

7 How comfortable do you feel speaking in front of your peers?

8 How comfortable do you feel speaking in front of children?

9 How confident do you feel about teaching science?

10 Would you feel comfortable talking to your clinical teacher in Junior 2 about leading discourse with students in science?

11 Would you feel comfortable talking with other students in your classes about leading science discourse?

12 What do you think you would need in preparation for becoming an effective science teacher?

Appendix B

Interview After Mursion 1

13 How comfortable do you feel speaking in front of your peers?

14 How comfortable do you feel speaking in front of children?

15 How confident do you feel about teaching science?

16 Would you feel comfortable talking to your clinical teacher in Junior 2 about leading discourse with students in science?

17 Would you feel comfortable talking with other students in your classes about leading science discourse?

18 Did you feel nervous while leading your Mursion Science Talk?

19 Did you feel that your Mursion students participated like students in the classroom would?

20 Did you find the Mursion technology to be realistic? Why or why not?

21 Did you find the Mursion technology to be beneficial? Why or why not?

Appendix C

Interview Before Mursion 2

22 How comfortable do you feel speaking in front of your peers?

23 How comfortable do you feel speaking in front of children?

24 How confident do you feel about teaching science?

25 Would you feel confident talking to a veteran teacher about new methods of teaching science?

26 What does effective science teaching look like?

27 What do you think you would need in preparation for becoming an effective science teacher?

28 How has your perception of teaching science changed since finishing the first Mursion simulation?

Appendix D

Interview After Mursion 2

1 How comfortable do you feel speaking in front of children?

2 How confident do you feel about teaching science?

3 Would you feel comfortable talking to your clinical teacher in Junior 2 about leading discourse with students in science?

4 Would you feel comfortable talking with other students in your classes about leading science discourse?

5 Did you feel nervous while leading your Mursion Science Talk?

6 Did you feel that your Mursion students participated like students in the classroom would?

7 Did you find the Mursion technology to be realistic?

8 How did this Mursion experience differ than the first one?

9 Did you feel more comfortable during this Mursion experience than the first one?

10 What did you do differently during this Mursion experience than you did in the first one?

Appendix E

Interview Before Classroom Experience

1. How comfortable do you feel speaking in front of your peers?
2. How comfortable do you feel speaking in front of children?
3. How confident do you feel about teaching science?
4. Would you feel confident talking to a veteran teacher about new methods of teaching science?
5. What does effective science teaching look like?
6. What do you think you would need in preparation for becoming an effective science teacher?
7. How has your perception of teaching science changed since finishing the second Mursion simulation?

Appendix F

Interview After Classroom Experience

1 How comfortable do you feel speaking in front of your peers?

2 How comfortable do you feel speaking in front of children?

3 How confident do you feel about teaching science?

4 Would you feel confident talking to a veteran teacher about new methods of teaching science?

5 What does effective science teaching look like?

6 What do you think you would need in preparation for becoming an effective science teacher?

7 How has your perception of teaching science changed since teaching in the classroom?

8 Did you feel nervous while leading your classroom Science Talk?

9 Do you feel that the Mursion experiences helped prepare you for the classroom experience?

10 What were some major differences between the Mursion experiences and the classroom experience?

Appendix G

Informed Consent to Participate in Research

Information to consider before taking part in research that has no more than minimal risk.

Title of Research Study: The impact on elementary pre-service teachers' self-efficacy and identity when using an immersive simulation classroom environment when learning how to lead discourse in science

Principal Investigator: Carley VanHoy (Person in Charge of this Study)
Institution, Department or Division: The Honors College at East Carolina University
Address: 203 N Eastern St., Greenville, NC 27858
Telephone #: (336)309-0068

Researchers at East Carolina University (ECU) study issues related to society, health problems, environmental problems, behavior problems and the human condition. To do this, we need the help of volunteers who are willing to take part in research.

Why am I being invited to take part in this research?

The purpose of this research is to better understand using immersive simulation as a teaching environment on elementary pre-service teachers' self efficacy and identity prior to a real classroom teaching experience. Your participation is completely voluntary. You are being invited to take part in this research because you are majoring in Elementary Education and are enrolled in a Science Methods course. The decision to take part in this research is yours to make. By doing this research, we hope to learn the impact of immersive simulation classroom environment on pre-service teacher' self-efficacy and identity.

If you volunteer to take part in this research, you will be one of about ___5____ people to do so.

Are there reasons I should not take part in this research?

I understand I should not volunteer for this study if I am, not an Elementary Education major, or I am not enrolled in a Science Methods course.

What other choices do I have if I do not take part in this research?

You can choose not to participate.

Where is the research going to take place and how long will it last?

The research will be conducted at East Carolina University. You will need to come to Flanagan 327 times during the study. The total amount of time you will be asked to volunteer for this study is 60 minutes over the next 3 months.

What will I be asked to do?

You will be asked to do the following:

- Participate in in a short, 10 minutes or less, interview before and after two Mursion sessions and one classroom experience (6 in total).

- The interview will be conducted by the Principal Investigator in a private setting. The Principal Investigator will read off questions and will record your answers via an audio recording device. All audio data will be deleted 3 years after the conclusion of research project.
- The questions will include demographic questions and questions related to your Mursion and classroom experiences.

What might I experience if I take part in the research?
We don't know of any risks (the chance of harm) associated with this research. Any risks that may occur with this research are no more than what you would experience in everyday life. We don't know if you will benefit from taking part in this study. There may not be any personal benefit to you but the information gained by doing this research may help others in the future.

Will I be paid for taking part in this research?
We will not be able to pay you for the time you volunteer while being in this study.

Will it cost me to take part in this research?
It will not cost you any money to be part of the research

Who will know that I took part in this research and learn personal information about me?
ECU and the people and organizations listed below may know that you took part in this research and may see information about you that is normally kept private. With your permission, these people may use your private information to do this research:

- Any agency of the federal, state, or local government that regulates human research. This includes the Department of Health and Human Services (DHHS), the North Carolina Department of Health, and the Office for Human Research Protections.
- The University & Medical Center Institutional Review Board (UMCIRB) and its staff have responsibility for overseeing your welfare during this research and may need to see research records that identify you.

How will you keep the information you collect about me secure? How long will you keep it?
The Principal Investigator will be the only person with access to the audio recordings. All audio recordings will be deleted 3 years after the conclusion of the research project. These recordings will not be used for anything other than the research.

What if I decide I don't want to continue in this research?
You can stop at any time after it has already started. There will be no consequences if you stop and you will not be criticized. You will not lose any benefits that you normally receive.

Who should I contact if I have questions?
The people conducting this study will be able to answer any questions concerning this research, now or in the future. You may contact the Principal Investigator at (336)309-0068 (days, between 8:00am and 11:00pm).

If you have questions about your rights as someone taking part in research, you may call the Office of Research Integrity & Compliance (ORIC) at phone number 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, you may call the Director of the ORIC, at 252-744-1971.

I have decided I want to take part in this research. What should I do now?

The person obtaining informed consent will ask you to read the following and if you agree, you should sign this form:

- I have read (or had read to me) all of the above information.
- I have had an opportunity to ask questions about things in this research I did not understand and have received satisfactory answers.
- I know that I can stop taking part in this study at any time.
- By signing this informed consent form, I am not giving up any of my rights.
- I have been given a copy of this consent document, and it is mine to keep.

_____

Participant's Name (PRINT) Signature Date

Person Obtaining Informed Consent: I have conducted the initial informed consent process. I have orally reviewed the contents of the consent document with the person who has signed above, and answered all of the person's questions about the research.

_____

Person Obtaining Consent (PRINT) Signature Date

Results

My research focused on the effects of using immersive classroom simulation as a means of preparing pre-service teachers to lead classroom discourse. This study aims to investigate the impact of using immersive classroom simulation as a teaching environment on elementary pre-service teachers' self-efficacy and identity prior to a real classroom teaching experience.

Student 1

Pre-Mursion 1 Talk Interview

Student 1 is in her second semester of her junior year at East Carolina University. She is Caucasian and identifies as a female. For the past three years she has had close to 12 hours of experience in the classroom. She has had only one session in the Mursion lab, in which she had a brief introduction to classroom management. Other technologies that Student 1 uses are her phone in the form of GPS, her computer, and her apple watch.

Student 1 said she feels "pretty comfortable" speaking in front of her classmates, but only after she has become accustomed to them. With children, however, she feels "super comfortable." As far as teaching science in the classroom, she does not feel too confident, but is genuinely interested in learning how to better her science knowledge. She does feel comfortable talking with other students in her class about leading science discourse, and the same goes for speaking with the teacher as well. In order to become an effective science teacher, Student 2 feels she would need more science classes to help prepare non science concentrators, such as herself.

Post-Mursion Talk, Pre-Classroom Talk Interview

Student 1 was initially very nervous while leading her first Mursion talk, but by the second one she said she "felt more relaxed and comfortable." She felt that the "students" participated like students in a real classroom would the majority of the time. She believes the practice with the avatars is beneficial, especially with the classroom management, because of how the level of disruptiveness can be fluctuated. Student 1 also found the Mursion technology to be beneficial because she sees how she needs to be super prepared before starting a discussion with students. She added that "Even though in the back of my head I knew the students weren't real, I feel like they acted very similar to how students in my classroom will."

Student 2

Pre-Mursion 1 Talk Interview

Student 2 is in her second semester of her junior year at East Carolina University. She is Caucasian and identifies as a female. The only classroom experience she has had teaching is her Junior 1 practicum (about 70 hours). When it comes to Mursion, she has only had one session with the technology where she gave a brief introduction to classroom management. Student 2 uses her phone and her computer, but tries to limit her usage.

Student 2 said she feels "moderately comfortable" speaking in front of her classmates, but she gets really nervous if she does not know them. With children, however, she feels "super comfortable" with them, no matter what the age. She added that she has a lot of cousins, ranging in ages from 2-18, that she spends a good amount of time with. As far as teaching science in the classroom, she does not feel too confident, but is genuinely interested in learning how to better her science knowledge. She does feel comfortable talking with other students in her class about leading science discourse, and the same goes for speaking with her science methods professor. In

order to become an effective science teacher, Student 2 feels she would need to watch other people, videos, and clarification that she has the right content.

Post-Mursion Talk, Pre-Classroom Talk Interview

Student 2 initially felt very nervous while leading her first Mursion session, but as she went on the nerves eased up. She felt that the "students" participated like students in a real classroom would, for the most part. However, she did feel that there were some limitations of the technology that made her even more aware that they were not real students. Even with this, she finds the technology to be fairly realistic. She believes the practice with the avatars is beneficial, especially with the classroom management, because of how the level of disruptiveness can be fluctuated. She was surprised with how relevant and realistic the questions the "students" asked were. Student 5 found the Mursion technology to be beneficial because she feels more confident in teaching science now. She thinks the technology is very helpful and interesting and looks forward to continuing to use Mursion. She added that "Usually before I teach a lesson, I can't wrap my head around [the content]. But Mursion helped me to feel less stressed once I got past the stress of being in Mursion with my peers."

Student 3

Pre-Mursion 1 Talk Interview

Student 3 is in her second semester of her junior year at East Carolina University. She is Caucasian and identifies as a female. For the past two years she has had experience in the classroom, with about four hours each year. When it comes to Mursion, she has not yet experienced this technology. Student 3 uses her phone and her computer for her school work.

Student 2 said she feels “pretty comfortable” speaking in front of her classmates, but she gets nervous if it is the first time meeting them. With children, however, she feels “pretty comfortable” with them, no matter what the age. As far as teaching science in the classroom, she does not feel too confident, but is beginning to feel more comfortable because of the Science Education class she is enrolled in at this time. She does feel comfortable talking with other students in her class about leading science discourse, and the same goes for speaking with the teacher as well. In order to become an effective science teacher, Student 3 feels she would need “a lot of tools” so that her lessons could be more hands-on, and not just worksheets.

Post-Mursion Talk, Pre-Classroom Talk Interview

Student 3 is feeling more comfortable speaking in front of her peers because of how frequently she is around them (every Monday, Wednesday and Friday). She also feels even more comfortable speaking in front of children, especially her students in her practicum class. She credits this to the increased exposure to them, which helps calm her nerves. Student 3 states that she did not feel nervous leading her Mursion session, and feels that the “students” participated like students in the classroom would. She also thought the technology was realistic, and by her second Mursion experience she was already feeling more confident. She feels that effective science teaching occurs when the student and teacher have a positive relationship and are able to work together in efforts to make the lesson more memorable and more effective. Additionally, she feels that a lot of resources and communication skills are vital to becoming an effective science teacher.

Student 4

Pre-Mursion 1 Talk Interview

Student 4 is in her first semester of her senior year at East Carolina University. She is Caucasian and identifies as a female. She has spent a good amount of time in the classroom due to the Junior 1 and 2 practicums. When it comes to Mursion, she has had to sessions for a math class and once for behavior management where she gave a brief introduction to classroom management. Student 4 uses her phone and her computer.

Student 4 said she feels "pretty comfortable" speaking in front of her classmates. She added that she used get nervous speaking in front of them, but not anymore. With children, however, she feels "really comfortable" speaking to them, no matter what the age. She added that sometimes it takes her a little while to find her place in the classroom, but after that she is good. As far as teaching science in the classroom, she does not feel too confident because she has never been in a Science Education course prior to Dr. Lee's course. She feels comfortable talking to her clinical teacher about leading science discourse, but she feels that the conversation would be mostly her asking questions. When it comes to talking to her classmates about leading science discourse, she feels that she might be hesitant at first, but she is a natural leader so she feels it would be a smooth transition. In order to become an effective science teacher, Student 4 feels she would need the support of her administration and lots of resources.

Post-Mursion Talk, Pre-Classroom Talk Interview

Student 4 continues to feel very comfortable speaking in front of children, and does not feel that this has increased or decreased over the semester. The same can be said of how she feels when speaking in front of her peers. Student 4 I feel fairly confident teaching science, adding that she still need more practice, but I feels more confident than she did coming into the course. She feels that she now understands the proper way to teach science lessons. During the first

Mursion session, she felt very nervous, but not quite as nervous during her second session. She felt that the "students" participated like students in a real classroom would, for the most part. However, she did feel that there were some limitations of the technology, especially with their hands, that made her even more aware that they were not real students. After conducting these two Mursion sessions, she now "see's the benefits of using science talks" in the classroom. In her eyes, effective science teaching is when teachers allow the students to learn from their questions. She adds that "[The students] should be able to lead the lesson and test their ideas. Learning through trials and collecting data is beneficial to the students." Student 4 feels that in order for her to be an effective science teacher she would need more practice teaching science lessons, to become familiar with the standards, have the resources she needs, and an administration/coworkers that support science education.

Student 5

Pre-Mursion 1 Talk Interview

Student 5 is in her second semester of her junior year at East Carolina University. She is Caucasian and identifies as a female. For the past two years she has had experience in the classroom, with about four hours each year. When it comes to Mursion, she has only had one session with the technology where she introduced herself to the "students." Student 5 uses her phone and computer a lot, but noted she has never used a SmartBoard.

Student 5 said she feels "moderately comfortable" speaking in front of her classmates. With children, however, she feels "pretty comfortable." As far as teaching science in the classroom, she does not feel confident at all, adding that she did not even learn very much science in elementary school, she she would have to "teach them something I'm not even 100%

knowledgeable about. She does feel comfortable talking with other students in her class about leading science discourse, and the same goes for speaking with the teacher as well. She feels that talking with others is a great way to hear new ideas. In order to become an effective science teacher, Student 5 feels she would need multiple ways to teach things so they could be differentiated for children who aren't familiar with scientific concepts, along with the tools and models to get the teaching done and the background knowledge in science.

Post-Mursion Talk, Pre-Classroom Talk Interview

Student 5 continues to feel comfortable speaking in front of her students. She even feels that her confidence in teaching the class has improved. When it comes to teaching science, she feels more confident, but still feels that she would "really have to do [her] research." It is interesting to note that she did not feel nervous at all throughout the second Mursion experience. When asked if she felt that the Mursion students participated like students in the classroom would, she strongly disagreed. She commented on the fact that the students were not as talkative as students in a real classroom, and they were quite reserved compared to her students in her practicum class.

Figure 1

Confidence Levels When Speaking to Students Before Mursion	Number of Students
Not confident	1
Somewhat confident	1
Confident	2
Very confident	1

Figure 2

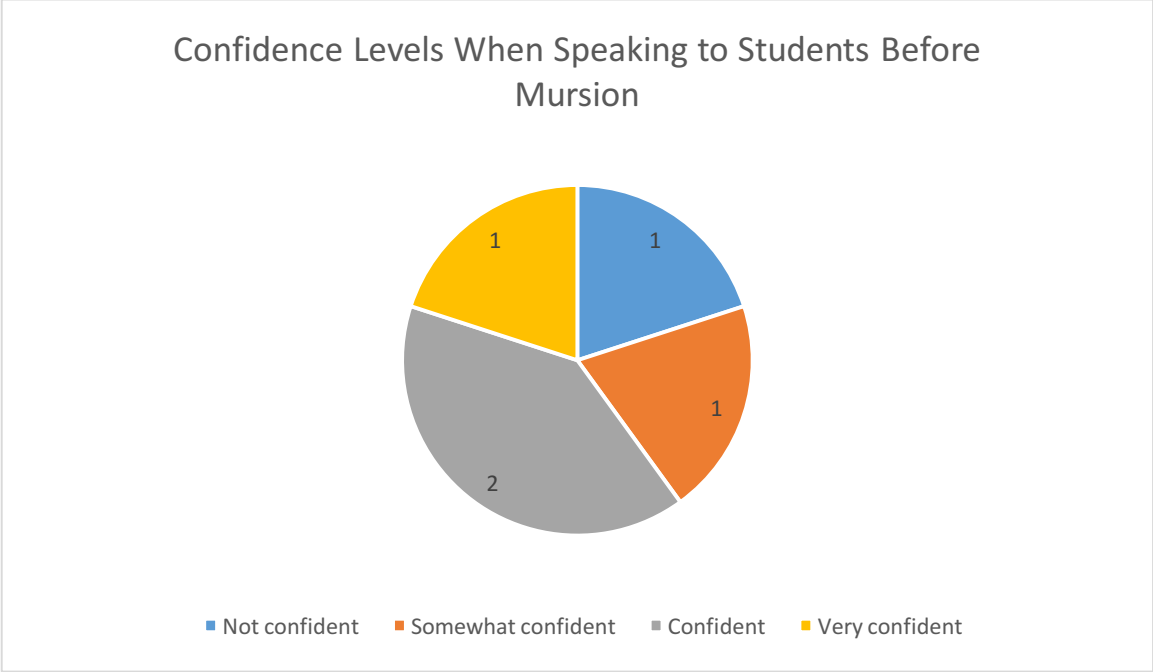


Figure 3

Confidence Levels When Speaking to Students After Mursion	Number of Students
Not confident	0
Somewhat confident	0
Confident	2
Very confident	3

Figure 4

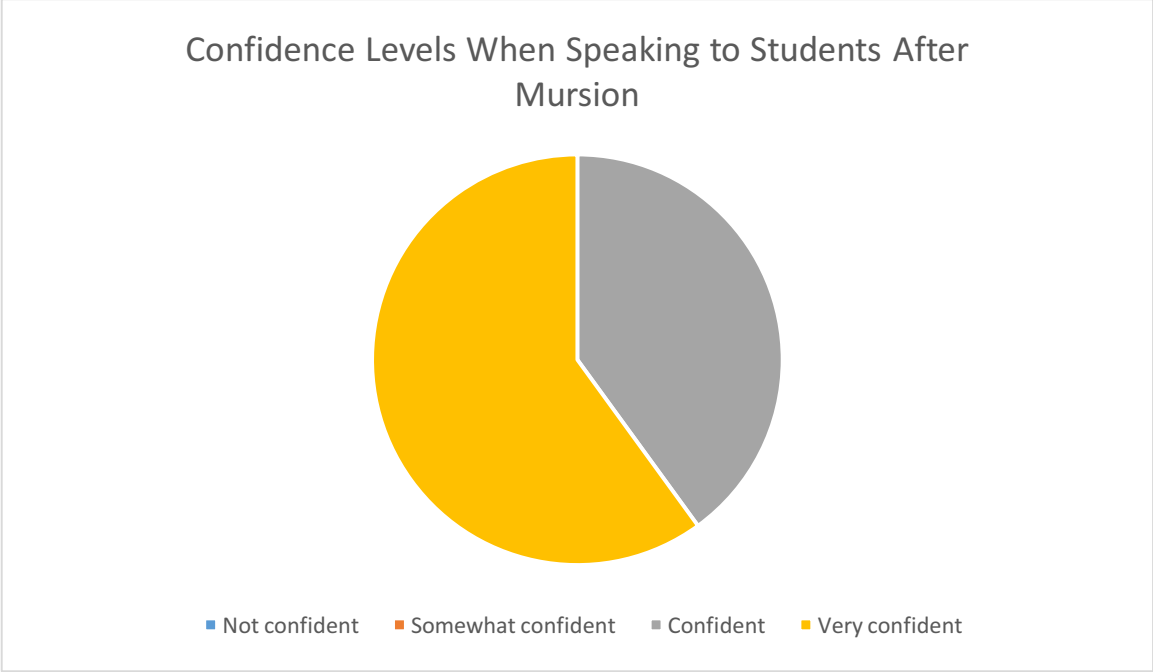
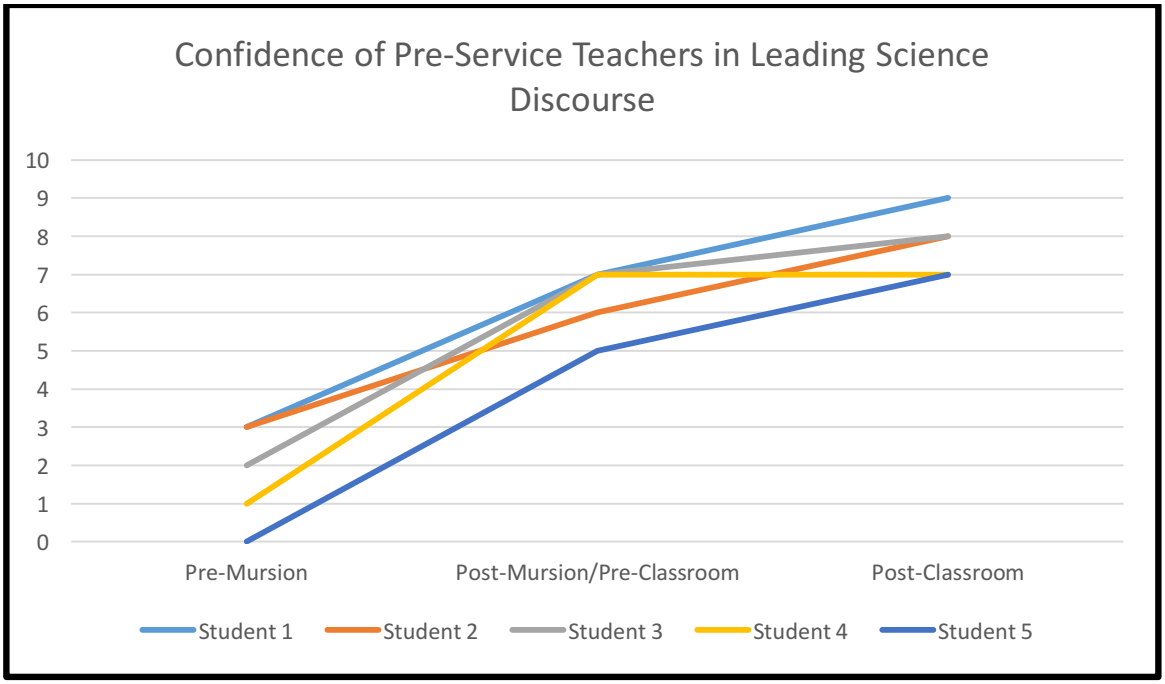


Figure 5



Conclusion

This data supports the theory that Virtual Reality Technology, specifically Mursion, is an affective tool when used to prepare pre-service teachers for leading science discourse. The Mursion experiences resulted in a higher sense of self-efficacy in the pre-service teachers. Students were able to support their interview question answers with evidence from the Mursion experiences using specific changes in mindset and classroom management. When comparing pre-interview and post-interview data, results showed improved confidence, as well as stronger understanding of leading classroom discussions. One trend found in the data suggests that pre-service teachers who with more experience in the classroom prior to Mursion were less likely to experience fluctuations in confidence levels after their Mursion experiences. Limitations in this study are the small amount of participants, and a lack of diversity among gender and ethnicity. Further research should be done to explicitly discover correlations between classroom experience and confidence levels before and after using Mursion technology.

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